

# VEGETABLE PLATES IN BOWEL AND STOMACH SURGERY; A DISCUSSION OF THE PROPER TECHNIQUE.

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AT intervals during the past summer and up to date, the writer has been interested to observe, in some dozen or more medical journals, several of which were kindly mailed him by friends, reviews of an article by Dr. R. von Baracz, of Lemberg, which appeared in the *Centralblatt für Chirurgie*, June 11, 1892; also of another by the same gentleman in the *Archiv. für Klinische Chirurgie*, Vol. XLIV, pp. 513-591.

The *British Medical Journal*, *London Lancet*, *New York Medical Record*, *New York Medical Journal*, *American Medical Journal* and the *Therapeutic Gazette* are a few of those which I remember; and last, not least, the *ANNALS OF SURGERY*, which considered the subject-matter of sufficient interest to discuss it twice—in its issue for September, and again in that for November. The latter review covered two pages.

The subject was the use (for which Dr. von Baracz claimed originality) of raw vegetable tissue as a material out of which to carve plates for intestinal anastomosis, gastro-enterostomy and similar operations; and because this widely-spread statement does me an injustice by attributing to another a method of my own devising, I beg the privilege of this correction, and at the same time will mention certain advantages of a plan which I think deserves to be better known.

Dr. von Baracz reports a series of experiments upon dogs by the means named; and his studies led him to prefer plates cut from the Swedish turnip to other kinds of raw vegetable tissue. The results of these experiments were so favorable as to induce him to try such plates upon the human subject.

Accordingly he did so on May 7, 1892, doing a gastro-enterostomy in a case of cancer of the stomach by the aid of the raw turnip plates. The patient recovered.

The surgeon was pleased with the method, and Dr. Richard Heigl, surgeon-in-chief of the Bürger Hospital of Coblenz, also employed it on July 20, 1892, in a gastro-enterostomy, using turnip-plates. This patient also recovered, so far as they could speak at the time the article was printed. Dr. Heigl, it seems, "praises these plates as better than Senn's."

Dr. von Baracz is, of course, unaware of his being second to myself in this field; and indeed I am glad to have had the independent work and corroboration of so able a surgeon. If, however, he will refer to the *New York Medical Record* for June 27, 1891, he will find that the writer published therein a series of experiments upon dogs, using just this method, the last seventeen of which were in every instance followed by recovery.

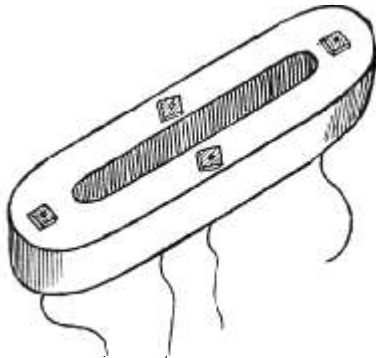


FIG. 1.—The potato plate ready for use (threads short and needles omitted).

The dogs were finally killed, and some two dozen specimens, together with a detailed report, were presented at a meeting of the surgical section of the New York Academy of Medicine.

Most of my spare time during the winter of 1890–1891 was devoted to such experiments, with plates cut from various kinds of raw vegetable tissue, in the Physiological Laboratory of the College of Physicians and Surgeons, this city.

Dr. von Baracz states that he began work in this line a year before his first paper was published, June 11, 1892. Therefore it will be seen that my experiments antedated his by at least six months, and my publication thereof by about a year.

In my *Record* article mentioned, occurs the following sentence: "I have experimented for some months, and used

many kinds of raw vegetable and fruit tissue. That which I like best for several reasons is raw potato." Raw turnips, carrots, sweet potatoes, parsnips and several other vegetables were tried, as was stated in the discussion following the reading of the paper, and on the whole the writer somewhat preferred, and still prefers, the white potato. When soaked for an hour or so in warm or tepid water (*not* carbolic, which softens it), it becomes as rigid almost as wood.

This is probably due to swelling of the starch-granules ; but is not accompanied by any marked change in shape of plates already cut out. After remaining for a few hours exposed to the digestive fluids of either stomach or bowel it begins to soften, while retaining its shape. At length it is completely digested and disappears, this occurring at a period of time varying according to what part of the alimentary canal it occupies. But always during the first ten or twelve hours at least—the time in which most of all we fear leakage at our anastomosis—it holds the peritoneal surfaces smoothly in contact.

In this length of time, or even half of it (if we have lightly scraped the surfaces to be apposed) we may be sure of firm agglutination. And after these hours of peril the softened plates yield to peristalsis, and quite easily cut free from their plate-sutures, taking themselves out of the way.

Contrast this with Senn's plates, occasionally sliding on each other and obstructing the opening ; and requiring at least a week or so to be removed after they have ceased to be needed ; tedious to prepare ; expensive ; requiring multiple sizes for various contingencies ; not to be gotten in emergency ; as to the opening, too small-sized. Whereas, on the contrary, these vegetable plates serve every purpose of Senn's ; are more quickly softened and absorbed when no longer needed ; carved in a minute ; always at hand ; may be made, if desired, with a four-inch opening ; and are devoid of cost.

The various catgut substitutes for plates are of comparatively little value because even after an hour in the wet, warm fæces they lose all rigidity, becoming absolutely limp. The same with segmented rubber rings filled with catgut strands.

In this country, to my knowledge, the vegetable plates have only been used once upon the living human subject, and in that instance, a year or so ago, by Dr. Andrew F. Currier, of this city.

I have a letter from this gentleman, giving the following details :

The operation, one for ovarian tumor, was difficult in the extreme, because of extensive and very firm adhesions. It had already lasted three hours or thereabouts when he tore into the ilium, the rent being of such a nature as to preclude closure by simple suturing. He should now (as he states) have made an artificial anus, instead of further prolonging the operation ; but instead sent for a potato, made and used the plates, performing a lateral anastomosis by their aid. The patient died within a few hours after, of shock. This case, of course, neither counts for nor against the vegetable plates.

About the time, not far from two years ago, when I first read the paper at the Academy upon this subject, I presented these specimens, and a thesis upon vegetable plates in intestinal surgery, in competition for a certain prize offered by the College of Physicians and Surgeons of New York.

The conditions under which the prize was offered demanded *original work* on the part of the competitors. There were three judges, of whom one only is a surgeon.

That committee decided not to award the prize that year, for the (publicly-stated) reason—note this—that none of the essays showed evidence of original work !

And now, after this lapse of time, comes forward this German surgeon, he also supposing his more recent work on the same subject is original ! And Drs. Bergmann and Billroth, by allowing him nearly eighty pages in a recent number of the *Archiv für Klinische Chirurgie*, of which journal they are editors, show that evidently they think it both new and of some value.

In the *Centralblatt für Chirurgie*, too, Drs. Bergmann and König index it under the head of "Original Communications."

It must be really just a trifle amusing to the surgical mem-

ber of that prize committee, he having all this while refrained from mentioning who *is* the real originator of this method!

I should have had no cause for complaint had the committee, in reporting adversely to my claim, given as their reason that none of the competing theses showed evidence of work of enough importance to science to deserve the prize. *That* might fairly be the decision at a time when, as now, the sentiment among most surgeons is against the use of plates or rings of *any* kind in intestinal work. Personally, however, I feel convinced that the present drift toward the older plan of suturing without such aids is a distinct retrogression, and will not long remain in favor.

It has been my lot to have abundant opportunity to try all the different methods as they have appeared from time to time, both upon dogs and in my operative surgery courses at the Polyclinic, and I am of opinion that, while in certain situations plates cannot be used, in general they can and should be, for one prime reason—speed. There can be no question in my mind after having demonstrated anastomosis by various plans almost every week, except in summer, for the past six years, that on an average ten to fifteen minutes will be saved by plates.

Speed, breathless speed, is, next to cleanliness, the keynote to success in abdominal work. It is only too often neglected, the patient “dying cured” in consequence. Ten minutes, even five minutes more with the abdomen open, may make all the difference between life and death.

I confess that I cannot see the logic in the following quotation from a recent article by Dr. Robert Abbe,<sup>1</sup> in which he takes somewhat different ground:

“The anastomosis was quickly completed, and the cleansed parts dropped back. The time of the anastomosis was forty minutes, but inasmuch as the entire operation, including search, separation of old adhesions, resection, etc., with concluding closure of the abdominal wall, occupied over three hours, I am free to confess that, to my mind, it makes little or no difference whether the time given to the act of uniting the bowel was thirty minutes or forty.”

<sup>1</sup> New York Medical Record, April 2, 1892.

To the writer it seems as if this added ten minutes were of even infinitely more gravity to the patient, in such case, than if the operation had been only a short one.

Regarding the question of safety (aside from the factor of speed) by bowel work by either method, two points are often neglected, and as I believe to the patient's peril.

The first is the *scraping of the peritoneum lightly*, wherever adhesion is desired. This can be done in a few seconds, and should not cause bleeding, if properly performed, but simply congestion; and because of this, a more rapid and certain plastic exudate sealing the apposed peritoneal surfaces.

Oddly enough, Dr. Abbe objects to such scraping, on the ground of unnecessary loss of time!

This matter seems to the writer hardly open to argument. Twenty cases in which rapid adhesion of *un*-scraped peritoneal surfaces has occurred would prove nothing herein, when compared with one in which smooth and unscraped peritoneal surfaces did *not* become agglutinated after a prolonged contact. Dr. Davis, among others, has reported an instance of this latter, although the surfaces were in contact many hours after being sutured.

A light scraping, as he first demonstrated, will render certain the formation of very firm adhesions within even three or four hours.

The second point which it seems to the writer is commonly neglected, although of utmost value, is always to give the patient, even before the anæsthetic, as large a dose of morphine by needle as is compatible with safety to his life.

In the first place, by following this procedure, much less ether or chloroform will be needed than if no morphine be used. And the consequent liability to vomiting, with its attendant risk of tearing out or loosening sutures, etc., is hence largely avoided. Probably, too, morphine is of some little value as a prophylactic against shock from the severe operation about to be undergone. I quite agree with Dr. John B. Roberts,<sup>1</sup> who, in discussing operative shock, says: "The preliminary hypodermic

<sup>1</sup> Am. Journ. Med. Sci., 1892, p. 258.

injection of morphine and atropine, always given a quarter or a half-hour before commencing anæsthesia, probably lessens the shock, and without much doubt diminishes the tendency to vomiting after etherization has been discontinued."

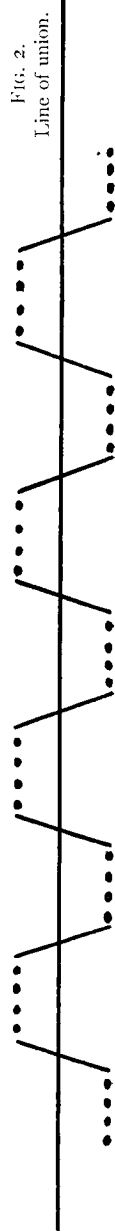
In the second place, because of that morphine, the bowel will be absolutely quiet, absolutely devoid of peristalsis, for hours afterward; and this is just what we need; *splinting* that gut for a short time.

Peristalsis during these critical hours before fibrin has sealed the spaces between our stitches, is fraught with such danger, that to permit it is almost like inviting a possible leakage, by forcing out a drop, here or there, of liquid poison.

Should we refuse morphine, we cannot depend for safety upon the paralysis, however commonly present, of the loop recently subjected to operation. For, although this portion may be quiescent, for some hours, yet the whole alimentary tube above will not be so! And semi-fluid fæces are being hurried along in surging currents, thrusting forcibly against the newly placed barriers, whether of thread or plates.

Indeed, it is only because I also insist upon the use of morphine as stated, that I think the use of plates absolutely safe without a complete row of stitches about them. During the hours while the plastic exudate from the lightly scraped peritoneum is sealing, more firmly than any sutures could seal, that wound, the intestine is as devoid of motion as if dead.

Let me here interpolate the remark that if the patient's general condition were excellent, and the abdominal cavity had not been very long opened (not otherwise) I should as precaution upon precaution, sew once entirely around the plates a running Lembert, or some similar stitch, such as that elsewhere illustrated (See Fig. 2.) And because of the smooth tension made possible by the plates, this sewing could be com-



pleted quite a little sooner, as well as more safely, than otherwise. In dealing with the lower half of the ilium, the danger of an occasional complete penetration with the needle is a very real one, save in expert hands—so very thin-walled is this part of the intestine.

To return to the question of a *morphine-splint*: The writer is not ignorant of the views upon peritonitis held by Lawson Tait and many other surgeons. The writer acknowledges the wisdom of its treatment, or better, prevention, by saline laxatives; but submits that here (as distinguished from ovarian or uterine surgery) exists an indication of the strongest kind for the use of morphine. And in the great majority of instances of this particular class of abdominal work, that indication outweighs, in his judgment, the arguments on the other side. Furthermore, it must be distinctly understood that the writer would not at all approve of continuing for an indefinite period to exhibit morphine, following bowel and stomach operations. When ten to twelve hours have elapsed, then we can feel assured that firm agglutination has occurred between our lightly-denuded peritoneal surfaces; an adhesion so firm as almost to tear elsewhere rather than yield at that spot. And now, the liability, or even the possibility, of leakage being practically past, the writer would, from this period *post operationem*, give hourly small doses of saline laxatives; and perhaps also a glycerine enema, should there be some tendency, then or later, to abdominal distention. Under this line of treatment the effect of the morphine upon intestinal peristalsis is, within a few hours, overcome; and usually quite readily so.

And what, now, becomes of the five-inch plates of potato or turnip within the gut?

After twenty-four hours, or if high in the intestinal canal, perhaps even a somewhat lesser period of exposure to the heat and digestive fluids therein, the plates will readily yield to the waves of peristalsis, first permitting the freest passage of fæces through the four-inch lumen, and presently cutting out at the plate-stitches because of extreme softening; and they will be swept away. Their four stitches, if, as seems preferable, of catgut rather than silk, are soon after absorbed and also disappear.



Perhaps the most recent of the plans now before the surgical world for anastomosis without plates or rings is that by Dr. Abbe, and which he affectionately describes as "the perfect technique of suturing." Briefly, this consists in a series of three concentric lines of continuous silk sutures about the new opening. The first of these—that is, nearest the cut—binds the wound-edges together, going through the entire thickness of the gut-wall; and is meant to check any bleeding. The second surrounds the wound a quarter of an inch distant from its edges—a "running Lembert;" and the third is again a quarter of an inch away. Of course, the order of application is not this, and very wisely; as much as possible of the sewing being completed before the bowel is opened. The writer has now demonstrated to classes this plan a good many times, and just as described by Dr. Abbe. As compared with plates (even when those plates have had a line of continuous suturing run about them), there cannot, it would seem, be any doubt that the former method compels at least ten minutes more of peritoneal exposure. If that added time would produce any added safeguard to the patient, as compared with plate-work, then Dr. Abbe and I would agree instead of amicably differing as to technique; but I think the reverse is the case. Still, let me add that I admire Dr. Abbe's artistic work; and that no one better than he can accomplish for a patient whatsoever lies in suturing deftly and with dextrous fingers. I agree, too, in his view "that lateral anastomosis" (as distinguished from end-to-end reunion) "properly done, is eminently the safest and best method of restoring the canal in most cases."

Also, I think that no lateral method should be considered for a moment which does not make provision for at least fifty per cent. contraction of the new opening, in the course of a few months to a year or more. Therefore the new and ingenious plan of Dr. J. B. Murphy of Chicago, with metal buttons, is not properly to be thought of in this matter. In performing cholecystenterostomy it really seems an ideal plan; but upon stomach, and in uniting bowel to bowel, because of the primary small caliber of the new opening (still further to be reduced with time), I venture to predict a justified lack of acceptance by the profession.

The writer will not in this article go over again the much-trodden field of discussion in pointing out in full the objections to any end-to-end device for bowel re-union. He wishes in conclusion simply to state in some detail a method of lateral anastomosis with plates, now practiced by him since the winter of 1890-91 (in entero-enterostomy only). In such operations—not very rarely needed, following, for instance, dead gut from a strangulated hernia, or resulting from tearing into the alimentary canal during separation of old adhesions in major gynaecology—the technique about to be described possesses two advantages over any other, with plates or without them. These are: (1) Opportunity to test by the water-test the perfection of the line of suturing. (2) Entire avoidance of possible infection of the line of intended adhesion by repeated accidental dragging out, necessitating tucking back of the cut bowel-edges, which are none too thoroughly disinfected at the best.

Regarding the first point (the hydrostatic test), it is with surprise that the writer has noted how little it has received attention. If the operator means to depend solely upon suturing for his union, one would suppose that from a half minute to a minute more spent in proving such stitches evenly and properly tight would be anything but wasted. Indeed, in the bladder this is commonly done. For instance, in the article repeatedly quoted, Dr. Abbe gives an example of this. It was in the first patient mentioned. Here, in dissecting adhesions, he tore into this viscus. This rent he “immediately sewed up and tested by forcing Thiersch’s solution into the bladder *to prove its perfect closure.*” Nevertheless, the gentleman regards this same procedure, as applied to bowel surgery, unnecessary and a waste of time.

The error lies in closing the bowel-ends *first*, and *then* making the lateral anastomosis, with its surrounding lines of suturing (or plates). Such technique of course prevents the water-test. If instead, as suggested by me, these steps be *reversed*, then by running a stream of warm water into one gut-end, through the new lateral opening and out of the other gut-end, how easy it is, in a moment, to notice a point of leakage and to correct it by an additional stitch! The tapes or clamps, always applied a few inches

away, of course prevent the water from taking another path than that desired. And *then* the bowel-ends are to be inverted and closed, instead of having made this the first step of the operation.

And how much more pleasant, so to speak, for the patient, to have a stream of leakage thus discovered, rather than subsequently upon the autopsy table!

As to the second point in technique mentioned, let me quote from a recent article by Dr. Robert F. Weir:<sup>1</sup> In speaking of anastomosis he says:

“I had already called attention . . . to the tendency of the opposed intestinal incisions to slip out beyond the rings. This also occurs with Senn’s plates, and, in fact, is common to all of these contrivances, so that special care in their use is demanded, and often the escaping portion requires to be tucked in between the plates more than once, before the restraining outside sutures are finally inserted.”

Had Dr. Weir used the method about to be described, he would not have had this complaint—and it is a just one—to make, regarding the usual methods either of suturing or of using plates. By the writer’s plan, any and all sewing to be done about the new opening is completed *before* that opening is made, and for just the reason given.

*Preparation of Plates.*—These are cut one-third of an inch in thickness, and on an average five inches, or nearly, in length. Their width is not great, allowing them to slip easily into the bowel. At first I made them too wide. A very narrow slit is all that we need. The powerful circular muscles cause the cut bowel-edges in the slit to retract so that they do not touch each other, and the prompt infection of these edges by fæces prevents the likelihood of their adhering even if they did touch. The slit should be nearly or quite four inches. Of course, this length is an added safety, immediate (as well as remote) because the freer the passage of fæces, when that begins, the less the strain on the integrity of the line of union.

Each plate is armed with four coarse catgut threads, not over nine inches long, to avoid tangling. The threads have a large knot, and before penetrating the plate we sew through a

<sup>1</sup> N. Y. Med. Record, April 9, 1892.

scrap of rubber cut from a drainage tube, or, lacking this, a minute bit of cloth: this to avoid cutting through. If no running line of sutures about the plate is contemplated, it will be best to use *six* instead of four threads in each plate. Tie with a single knot each thread in the eye of its needle (a round, straight milliner's needle); this to prevent accidental unthreading at an awkward time. The needles should all have their points buried in bits of potato, each about the size of a pea. If time permits, immerse the plates for a half hour in warm water, to make them more rigid and hard.

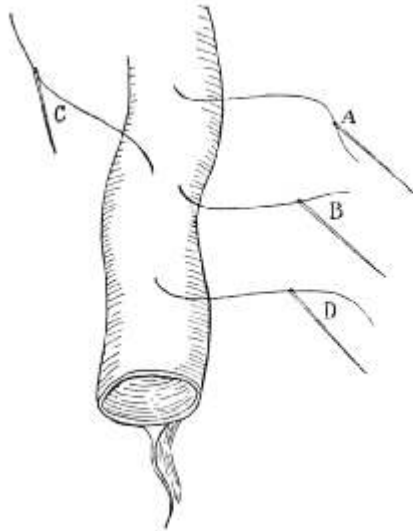


FIG. 3.—A plate in place and ready to tie to its fellow.

*Method of Using the Plates.*—Assume that the tapes or clamps are applied, and the bowel properly cleansed out by irrigation. Now—

(1*a*) Seize a needle with the needle holder so that it shall be in the long axis of the holder. Begin with the one marked *A* in the accompanying diagram (Fig. 3). Pass the needle several inches (about seven in operation upon the small intestine) into one of the open gut-ends, and when the place is reached at which, in the judgment of the operator, it should come through, detach the bit of potato from its point with the fingers, seizing it from

without, and then pass the needle through and out. The little piece of potato will take care of itself, dropping to the bottom of the bowel; it is insignificant. The spot at which the end sutures, *A* and *D*, should escape, is one directly opposite the mesenteric attachment; that is, as far as possible from the mesentery. Now (after *A*) pass needles *B* and *C* in the same way. After each thread is passed, it should be held by an assistant tense against the wall of the gut on the side where it belongs, and the next needle should carefully run along the opposite wall; this to avoid tangled threads. Pull lightly on threads *A*, *B* and *C*, while pushing the plate from behind, drawing it thereby into place within the intestine. Push rather than pull, to avoid oblique tension on the threads and possible cutting of the plate. Next pass *D*, and draw it also taut.

Go through the same steps with the other plate and the other gut-end. Always leave at least a full inch and a half between the plate-end and the gut-end, in each instance.

(1*b*) The following alternate method of introducing the plate and its threads is, so far as the suggestion of the shorter needles is concerned, due to Dr. H. M. Hall, of Seattle, Washington, who recently took an operative course with me. The plate is to be armed with four (or six) short, straight, round (so-called gynæcological) needles, only one-half to two-thirds of an inch long. Their threads need not exceed four inches in length. (In other respects they are prepared as in the other plan). These needles are inserted into the plate at their proper places, and their points made to penetrate just to the thickness of the plate, but no further. (These preparations are, of course, made before the operation begins.) The plate thus prepared is laid, needle-hilts downward, upon a thin, long strip of wood, as wide as the plates—a piece of cigar-box, for instance—and both are inserted together a sufficient distance into the intestine, from its open end. By placing the four short plate threads each on its own side of the wooden strip, tangling during the insertion is avoided. It is now the work of but a moment to press upon the bowel overlying the plate, and thereby force the needles through at exactly the right places. Their points are seized by the needle holder, and each is drawn through until its thread is tense.

By this technique, which I prefer to the other, both plates may be inserted and their threads tied in less than two minutes. The former technique would be necessary where only ordinary needles are procurable, *i. e.*, in emergency work.

(2) Wipe off the threads with a cloth wet in some antiseptic solution. Of course this is not essential, but is a safeguard.

(3) Scrape lightly but thoroughly with a scalpel the surfaces to be coapted; this also includes the ends to be inverted.

(4) Tie the four anchor (plate) threads each to its appropriate fellow, being careful to draw snugly but not to make extreme pressure. Tie first the threads on the lower (under) side of the seat of operation. Sloughing is of course possible if no care is used; though because of rapid softening of the plates inside of twenty-four hours it is less a danger even in careless hands than if bone plates were used.

Experience proves that it is of little moment in which directions the open ends are pointed, before this ligation of the threads; that is, whether in opposite directions or not.

(5) Take one square Lambert stitch at the plate-edges, opposite to and concealing each of the four (or six) plate-stitches. This is precautionary. In the event of a drop of pus forming where a plate-stitch penetrates the gut (infection by capillarity), that pus, like any other fluid, would move in the direction of least resistance, and, the softened plates not opposing, would be obliged, by this square stitch, to re-enter the intestines at the cut edge.

As an alternate choice—and perhaps preferably to such interrupted stitches—we may, as a matter of convenience, begin the entire operation by a straight, running line of suture five inches long, between the loops to be joined, and about one-fourth inch from their mesenteric border. This line, may if desired, be continued and carried completely around the plates, after these have been tied together. The stitches are rapidly inserted, being no more than three to the inch, and are preferably of the kind illustrated in Fig. 2. The surfaces are smoothly coaptated, and sloughing, from over-tension, is hardly possible; because the pressure from any stitch of this continuous thread is not met by that of an opponent across the line of union.

Just as in suturing without plates, about the opening, great care should here be exercised lest the surgeon sew too deeply and penetrate into the bowel. As has been previously remarked, the smooth, though moderate, tension about the plate-edges permits very rapid and accurate sewing.

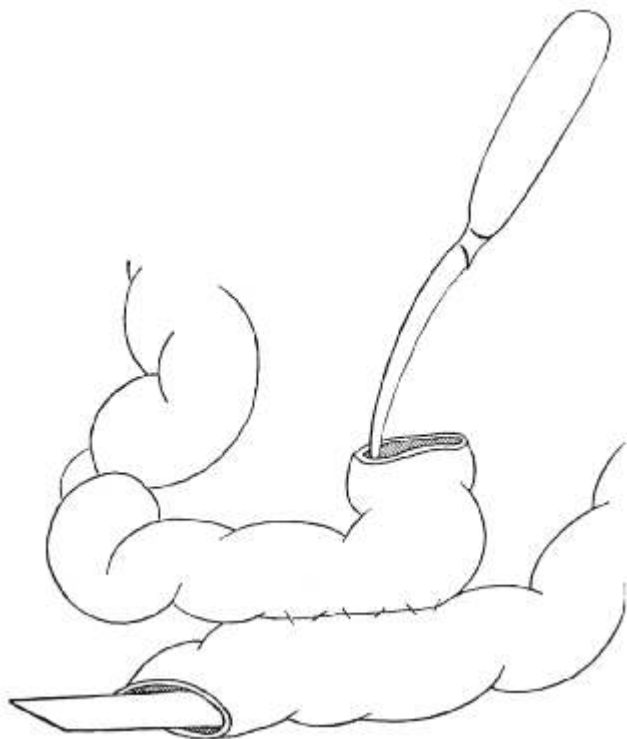


FIG. 4.—The suturing about the plates is completed; the anastomotic opening is being made; in short lines the row of sutures is indicated roughly. (When properly tightened, the sutures cannot easily be seen, of course.) Sharp-pointed scissors should be substituted for the knife, in this illustration.

If the patient were in real and immediate jeopardy, I would advise not stopping for sutures at all; but, as the end of the bowel technique, to wrap around the plates at their line of union a long strip cut from the omental edge. A preliminary cobbler's ligature to the omentum will avoid loss of blood here. This, by actual count, may be done in one minute. Such an omental

strip is stated by Senn to be almost sure to live, though completely detached, becoming firmly adherent where it rests, and is a decided additional safeguard against possible leakage, with consequent infection.

(6) Run into one open gut-end a thin strip of wood as wide as the potato-plate. This is to cut against.

(7) Now we make our opening through the opposed and sealed gut-walls. I strongly advise for this purpose straight, sharp-pointed scissors, instead of the bistoury indicated in the illustration (Fig. 4). If desired, by a little trouble, the bowel-end may be so held as to render the line of incision visible its whole length; but this is hardly worth while, as with the scissors one can very easily feel, before cutting, the slit in the plate, and thus be exactly guided. We should make as long an anastomotic opening as the plates will allow. The strip of wood opposite, which has prevented cutting too deeply, is now removed.

Should bleeding follow, of more than trivial degree, it could easily be controlled by forceps. As stated, the incision is open to inspection—from either end—with a little care. Also, the potato is elastic enough to permit, without harm, a temporary widening of the slit by any blunt means, for greater ease in seizing a vessel.

However, annoying bleeding is very unlikely to happen, both because the point at which the bowel is divided is that farthest from the mesentery, and, therefore, where the vessels are smallest; and, also, for the reason that the moderate pressure of the plates would tend to check it.

(8) Irrigate. Under very gentle hydrostatic pressure, closing the outlet end with finger and thumb for a few moments, the line of suture, or union, should not leak, if contact is properly made.

(9) Invert and close the ends, each with one running line of suture, as in Fig. 2. The free end is seized with dressing-forceps and turned in until the plate is felt. The forceps holds it thus inverted, while the stitches are placed. The long intussusceptum, far from being the danger that was once feared, proves a decided protection against leakage. A few needles, temporarily thrust through the intussusceptum transversely, prove of aid in preventing the rolling out of a part of the end during sewing.



(10) Take a stitch or two between the blind ends and the bowel, against which each should rest, first scraping lightly. This sewing prevents possible forcing of another loop into this angle, with resultant undue tension on the stitches at the plate-ends; an accident which led to leakage in one of my first experiments on dogs. It is also a safeguard against intussusception into the new opening, which has been observed by one worker in this field (Robinson). Of course, this point in technique is as applicable to lateral anastomosis without plates as with them.

Finally, of course, we remove the clamps or tapes from the bowel on either side of the region just subjected to surgical treatment.

For the sake of clearness, ten successive steps in performing the operation have been numbered and itemized; but it will be noted that half of these are not peculiar to this, or any other plate method, but are just as advisable when suturing alone, without such aids, is attempted.

I know of no briefer, no safer plan. It is my hope that the points discussed in this paper, and which the reader may not heretofore have put in practice, will be accorded an unbiased trial. They are the fruit of a number of years of work in this line; and the conclusions have not been drawn without time for consideration.